

WHAT IS CLAIMED IS:

1. A complex circuit board comprising: a dielectric substrate; a magnetic substrate, a space being provided between the magnetic substrate and the dielectric substrate; and an electrode provided between said dielectric substrate and said magnetic substrate; wherein

said electrode is relatively near to said dielectric substrate and relatively far from said magnetic substrate at a predetermined position, and is relatively near to said magnetic substrate and relatively far from said dielectric substrate at another position which is different from said predetermined position.

2. The complex circuit board according to Claim 1, wherein said electrode is adjacent to or spaced a predetermined distance from said dielectric substrate at said predetermined position, and is adjacent to or spaced a predetermined distance from said magnetic substrate said other position which is different from said predetermined position.

3. The complex circuit board according to Claim 2, further comprising a substance having a lower dielectric constant than the dielectric substrate, the substance being provided between said dielectric substrate and said electrode at said other position.

4. The complex circuit board according to one of Claims 1, 2, and 3, wherein the electrode is continuous between said predetermined position and said other position.

5 5. The complex circuit board according to one of Claims 1, 2, and 3, wherein said electrode is provided by a substrate having an electrode portion on a top face thereof and an electrode portion on a bottom face thereof, the electrode portions being connected by a through hole, said substrate being disposed between said dielectric substrate and said magnetic substrate.

5 6. The complex circuit board according to one of Claims 1, 2, and 3, wherein said electrode comprises a capacitance element at said predetermined position near said dielectric substrate, and an inductance element at said other position near said magnetic substrate.

7. The complex circuit board according to one of Claims 1, 2 and 3, wherein the dielectric substrate is provided at least at said predetermined position and is smaller than said magnetic substrate.

8. The complex circuit board according to one of Claims 1, 2 and 3, wherein the magnetic substrate is provided at least at said other position and is smaller than said dielectric substrate.

9. A nonreciprocal circuit device comprising: the complex circuit board according to Claim 6 having a plurality of intersecting said inductance element portions and a corresponding plurality of said capacitance element portions connected thereto; and a magnet arranged to apply a dc magnetic field to said intersecting inductance element portions.

10. A resonator comprising the complex circuit board according to Claim 6, wherein said capacitance element and said inductance element define a predetermined resonant frequency for said resonator.

11. A filter comprising: the resonator according to Claim 10; and a pair of input/output connectors connected respectively to opposite ends of said electrode.

12. A duplexer comprising: at least two filters, at least one of said filters comprising the filter according to Claim 11; each of the filters having a respective said pair of input/output connectors; and an antenna connector connected to a respective one input/output connector of each of said filters; and

the other said input/output connector of each of said filters being a respective input/output terminal of the duplexer.

13. A communications device comprising: the

duplexer according to Claim 12; a transmitting circuit connected to one of said input/output connectors of the duplexer; and a receiving circuit connected to the other  
5 one of said input/output connectors of the duplexer.

14. The communications device according to Claim 13, further comprising an antenna connected to the antenna connector of said duplexer.

15. A nonreciprocal circuit device comprising: a dielectric substrate; a magnetic substrate, a space being provided between the magnetic substrate and the dielectric substrate; an electrode provided between said  
5 dielectric substrate and said magnetic substrate, the electrode comprising a resonator portion and a transmission line portion; and a magnet applying a dc magnetic field to said electrode; wherein

the transmission line portion of said electrode is  
10 relatively near to said dielectric substrate and relatively far from said magnetic substrate, and the resonator portion of said electrode is relatively near to said magnetic substrate and relatively far from said dielectric substrate.

16. The nonreciprocal circuit device according to Claim 15, wherein the transmission line portion of said electrode is adjacent to or spaced a predetermined distance from said dielectric substrate, and the

5 resonator portion of said electrode is adjacent to or  
spaced a predetermined distance from said magnetic  
substrate.

17. The nonreciprocal circuit device according to  
Claim 16, wherein a substance having a lower dielectric  
constant than the dielectric substrate is provided  
between said dielectric substrate and said resonator  
5 portion of said electrode.

18. The nonreciprocal circuit device according to  
one of Claims 15, 16 and 17, wherein said electrode is  
provided by a substrate having an electrode portion on a  
top face and an electrode portion on a bottom face, the  
5 electrode portions being connected by a through hole,  
said substrate being disposed between said dielectric  
substrate and said magnetic substrate.

19. The nonreciprocal circuit device according to  
one of Claims 15, 16 and 17, wherein the dielectric  
substrate is provided at least adjacent said transmission  
line portion of said electrode and is smaller than said  
5 magnetic substrate.

20. The nonreciprocal circuit device according to  
one of Claims 15, 16 and 17, wherein the magnetic  
substrate is provided at least adjacent said resonator  
portion of said electrode and is smaller than said

5 dielectric substrate.

21. A communications device comprising: the nonreciprocal circuit device according to Claim 15; and one of a transmitting circuit, a receiving circuit, and an antenna connected to said nonreciprocal circuit  
5 device.

22. A method for manufacturing a complex circuit board comprising the steps of: providing a dielectric substrate; providing a film of low dielectric constant, comprising a substance having a lower dielectric constant  
5 than the dielectric substrate, on said dielectric substrate; providing an electrode pattern on the dielectric substrate and on the film of low dielectric constant thereon; and affixing a magnetic substrate to the dielectric substrate and to the electrode pattern  
10 thereon.

23. A method for manufacturing a complex circuit board comprising the steps of: providing a dielectric substrate; providing a magnetic substrate; providing electrode patterns respectively on top and bottom faces  
5 of a substrate of low dielectric constant having a lower dielectric constant than the dielectric substrate; providing a through hole running between the electrode pattern on the top face and the electrode pattern on the bottom face; and affixing said dielectric substrate to

10        said magnetic substrate so as to clasp said substrate of  
low dielectric constant therebetween.

24. A method for manufacturing a complex circuit  
board comprising the steps of: providing a dielectric  
substrate; providing an electrode pattern on said  
dielectric substrate; providing a magnetic substrate;  
5        providing an electrode pattern on said magnetic  
substrate; arranging said dielectric substrate and said  
magnetic substrate so that their faces provided with said  
electrode patterns are facing each other, said electrode  
patterns facing each other at a predetermined connection  
10        portion, and connecting the electrode pattern of said  
dielectric substrate to the electrode pattern of said  
magnetic substrate at said predetermined connection  
portion.

25. A method for manufacturing a nonreciprocal  
circuit device comprising the steps of: providing a  
dielectric substrate; providing a film of low dielectric  
constant, comprising a substance having a lower  
5        dielectric constant than the dielectric substrate, on  
said dielectric substrate; providing an electrode pattern  
comprising a resonator portion which is formed at the  
portion of said dielectric substrate where said film of  
low dielectric constant is provided, and a transmission  
10        line portion which is formed at other portions thereof;  
affixing a magnetic substrate to said dielectric

substrate and to said electrode pattern; and providing a magnet for applying a dc magnetic field to said electrode pattern.

26. A method for manufacturing a nonreciprocal circuit device comprising the steps of: providing a dielectric substrate; providing a magnetic substrate; providing electrode patterns respectively on top and  
5 bottom faces of a substrate of low dielectric constant having a lower dielectric constant than the dielectric substrate, the electrode patterns forming a resonator portion and a transmission line portion; providing a through hole running between the electrode pattern on the  
10 top face and the electrode pattern on the bottom face; affixing said dielectric substrate to said magnetic substrate so as to clasp said substrate of low dielectric constant therebetween, and so that said magnetic  
15 substrate is adjacent to or spaced a predetermined distance from the resonator portion, and said dielectric substrate is adjacent to or spaced a predetermined distance from the transmission line portion; and providing a magnet applying a dc magnetic field to said electrode patterns.

27. A method for manufacturing a nonreciprocal circuit device comprising the steps of: providing a dielectric substrate; providing an electrode pattern forming a transmission line portion on said dielectric



5        substrate; providing a magnetic substrate; providing an  
electrode pattern forming a resonator portion on said  
magnetic substrate; arranging said dielectric substrate  
and said magnetic substrate so that their faces provided  
with said electrode patterns are facing each other, said  
10       electrode patterns facing each other at a predetermined  
connection portion; connecting the electrode pattern of  
said dielectric substrate to the electrode pattern of  
said magnetic substrate at said predetermined connection  
portion; and providing a magnet for applying a dc  
15       magnetic field to said electrode patterns.